

REMARKS/ARGUMENTS

Favorable consideration of this application in light of the following discussion is respectfully requested.

Claims 1-18 are pending in the application.

In the outstanding Office Action, Claims 1-8 and 11-18 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mori et al. (U.S. Patent No. 6,242,825; hereinafter "Mori") in view of Igashira et al. (U.S. Patent No. 4,471,256); Claims 1, 2, 9 and 10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mori in view of Ishimatsu et al. (U.S. Patent No. 6,777,478 (Patent Publication No. 2001/0030022), hereinafter Ishimatsu).

By way of background, the present invention relates to a coil for an electric rotating machine wherein a mica tape, which includes mica flakes and cloth-like backing materials, is wound as a plurality of layers around a conductor including a plurality of Roebel-transposed square strands, and the layers of the mica tape are impregnated with an impregnating resin and then cured. The feature of this coil is that insoluble glue is contained as one constituent in an adhesive for bonding inorganic particles to the mica tape.

In conventional methods for insulating an armature coil of a high-voltage electric rotating machine, a mica tape is wound around a conductor with an impregnating resin. In these conventional methods, an adhesive in the mica tape has mutual dissolubility with the impregnating resin such that they can be formed integrally with each other. If, however, inorganic particles are supported with the adhesive, the adhesive dissolves mutually with the impregnating resin and loses its supporting function. Thus, disadvantageously, in a subsequent pressure molding step, the inorganic particles flow out of the mica tape layers together with the residual adhesive and the impregnating resin to thereby decrease the thermal conductivity of an insulation layer of a coil.

According to the present invention, the above problem is resolved by adding insoluble glue in the impregnating resin, such as polyvinyl alcohol, to an adhesive such as epoxy resin so as to support the inorganic particles. Thus, a first function necessary for the glue of the present invention is to not interfere with the mutual dissolubility between the impregnating resin and the adhesive in the mica tape. This first function is not disclosed in any of cited references.

The mica tape wound around the conductor is pressurized by a pressure jig. The residual impregnating resin and the adhesive mutually dissoluble with the impregnating resin are squeezed from the mica tape layers. Conventionally, the inorganic particles may also flow out together with the residual impregnating resin and the adhesive. If, however, there is glue insoluble in the impregnating resin, the glue increases the viscosity of the adhesive and its high-molecular chain catches the inorganic particles to prevent the inorganic particles from flowing out. The second function necessary for the glue is therefore to increase the viscosity of the adhesive and catch the inorganic particles to prevent them from moving. This second function is not disclosed in any of the cited references either.

Consequently, Applicants' glue insoluble in the impregnating resin contained in the adhesive need not function as an adhesive, thus distinguishing over the glues of Igashira and Ishimatsu. Moreover, in the present invention, the glue, such as polyvinyl alcohol, is dissolved in the adhesive in the mica tape and thus is brought into the same condition as that of glue dissolved in oil. Applicants' glue therefore cannot serve as a so-called adhesive for directly bonding the particles described in Igashira and Ishimatsu. It is evident from the above that none of the references disclose or suggest "an adhesive containing glue insoluble in an impregnating resin" as recited in Applicants' originally filed claims. Applicants' claims should not be therefore rejected as being unpatentable over the references. Further details follow.

Applicants first remind the Examiner of the interview of December 13, 2004. During the interview, the Examiner acknowledged that both Mori and Igarashi fail to disclose or suggest “an adhesive containing glue insoluble in [an] impregnated resin” as recited in Applicants’ originally filed independent Claims 1, 2, 13, and 16. The arguments presented during this interview and in Applicants’ previously filed response are reintroduced below.

Briefly recapitulating, Claim 1 is directed to a coil for an electric rotating machine, The coil includes a) a conductor configured by bundling a plurality of square strands and stacking the square strands like a coil with Roebel transposition; b) mica tape which is wound a plurality of layers around on surface of the conductor and made up of mica paper and cloth backing material; c) an insulation layer formed with impregnating and curing resin between wound layers of the mica tape; and d) inorganic particles supported with the mica tape using an adhesive containing glue insoluble in the impregnated resin as a component. Independent Claims 2, 13, and 16 are directed to alternative embodiments of Applicants’ invention that include inorganic particles which are supported by a mica tape or a cloth backing material of the mica tape using an adhesive containing glue insoluble in the impregnated resin as a component. The claimed invention provides for improved thermal conductivity.¹

Mori discloses a stator coil of electric rotating machinery.² This stator coil is substantially the same as that described in “Description of the Related Art” of the Applicants’ specification. Limitations of a conventional stator coil are described in the specification, page 7, line 19 through page 9, line 6 and will be specifically discussed below.

Mori discloses two methods for insulating the stator coil. The first method of Mori is directed to a resin-rich insulation molded by hot plate pressurizing or molded by liquid compound pressurizing. Hot plate pressurizing is performed by winding a semi-cured mica tape containing an adequate amount of resin around a conductor a plurality of times and then

¹ Specification, Figures 4-5.

² Mori, abstract.

molding and curing the mica tape layers by heat pressing using a hot plate. Liquid compound pressurizing is done by attaching a molding jig and pressing and curing the mica tape layers at the same time using a liquid compound. The second method of Mori is directed to vacuum pressure impregnation insulation that is performed by winding a mica tape containing a small amount of resin around a conductor a plurality of times, then impregnating the resin into the layers of the mica tape by vacuum pressure impregnation, then attaching a jig to the stator coil for pressure molding, and curing the mica tape layers.

Applicants' claimed inventions represent an improvement to the convention methods of vacuum pressurized impregnation insulation. Conventionally, in a vacuum pressure impregnation insulation method using inorganic particles, the inorganic particles are supported by a mica tape using an adhesive, where an impregnating resin is impregnated into the mica tape layers wound around the conductor and then cured to form an insulation wall. The adhesive requires mutual dissolubility to be formed integrally with the impregnated resin. In the conventional resin impregnation process, therefore, the adhesive and impregnated resin are mutually dissolved and at the time of the above pressure molding the impregnated resin is squeezed and the inorganic particles flow out of the adhesive dissolved in the remaining resin. The insulation wall therefore decreases in thermal conductivity.

However, as note previously, in the present invention the adhesive contains glue ***insoluble in the impregnated resin*** even though the adhesive requires dissolubility to be formed integrally with the impregnated resin. With Applicants' claimed invention, it is possible to prevent inorganic particles from flowing out while maintaining the dissolubility of the adhesive. As noted in the Official Action, Mori does not disclose or suggest "inorganic particles supported with the mica tape using an adhesive containing glue insoluble in the impregnated resin as a component" as recited in Applicants' independent claims.

Igashira discloses a piezoelectric actuator in which an adhesive containing polyvinyl alcohol and other adhesives are used as one for combining particles into a predetermined shape. However, as acknowledged by the Examiner during the interview, the adhesives of Igashira does not disclose or suggest an “adhesive containing glue insoluble in the impregnated resin as a component” as recited in Applicants’ independent Claims. Igashira only discloses uses of an adhesive containing polyvinyl alcohol. However, this polyvinyl alcohol is not insoluble in an impregnating resin (neither are the other adhesives disclosed by Igashira). That is, Igashira discloses polyvinyl alcohol as an adhesive for bonding inorganic particles. However, this polyvinyl alcohol is merely a typical example of a sintering aid commonly used to produce ceramics from sintered inorganic particles. The functions of the polyvinyl alcohol are to bond particles together into a given shape at room temperatures and to dissipate the particles without any residue by a heating process performed at high temperature during sintering or performed usually before the sintering. If these functions are satisfied, the adhesive of Igashira need not be polyvinyl alcohol in particular. Igashira does not refer to any reason why the adhesive is polyvinyl alcohol. Aside from polyvinyl alcohol, cellulose, paraffin, or wax is commonly used as a sintering aid.

MPEP §706.02(j) notes that to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. Also, the teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant’s disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

With regard to the first prong of the test of obviousness, Applicants submit that the Official Action does not present a *prima facie* case of obviousness because both Mori and Igashira fail to disclose all the features of Applicants' claimed invention. As none of the cited prior art, individually or in combination, disclose or suggest all the elements of independent Claims 1, 2, 13 and 16, Applicants submit the inventions defined by Claims 1, 2, 13 and 16, and all claims depending therefrom, are not rendered obvious by the asserted references for at least the reasons stated above.³

Furthermore, Igashira is not directed to or related to a coil for a rotating electric machine. Instead, Igashira is directed to forming a clay plate serving as an actuator. Applicants submit there is no teaching, suggestion, or motivation, either explicitly or implicitly, in either reference to combine the stator coil of Mori with the clay plate of Igashira to arrive at Applicants' inventions recited in Claims 1, 2, 13 and 16. That is, the sintering aid of Igashira is basically required for producing sintered ceramics and thus totally irrelevant to the technical field of the electric rotating machine of the present invention. Thus, Applicants submit it is only through an impermissible hindsight reconstruction of Applicants' invention that the rejection of Claims 1, 2, 13 and 16 can be understood.⁴

Finally, even assuming *arguendo* that Mori and Igashira disclose each feature of Applicants' claimed invention, because Igashira fails to disclose that the polyvinyl alcohol is soluble in a resin, the combination of Mori and Igashira would fail to prevent the inorganic particles from flowing out while maintaining the dissolubility of the adhesive, as is possible with Applicants' claimed invention.

³ MPEP § 2142 "...the prior art reference (or references when combined) must teach or suggest **all** the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)."

⁴ MPEP § 2143.01 "Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge of one of ordinary skill in the art."

Ishimatsu discloses an adhesive including polyvinyl alcohol as one used for bonding or mounting electronic components on a circuit board. The functions of the adhesive is to secure human safety as well as to improve the reliability of conductivity and the strength of bonding as in the prior art. If these functions are satisfied, the adhesive of Ishimatsu need not be polyvinyl alcohol in particular. Also, Ishimatsu does not refer to "an adhesive containing glue insoluble in an impregnating resin" as recited in Applicants' originally filed claims, nor does it disclose or suggest a mica tape or a mica sheet that is so configured that inorganic particles are supported by the adhesive at all.

Again with regard to the first prong of the test of obviousness, Applicants submit that the Official Action does not present a *prima facie* case of obviousness because both Mori and Ishimatsu fail to disclose all the features of Applicants' claimed invention. As none of the cited prior art, individually or in combination, disclose or suggest all the elements of independent Claims 1, 2, 13 and 16, Applicants submit the inventions defined by Claims 1, 2, 13 and 16, and all claims depending therefrom, are not rendered obvious by the asserted references for at least the reasons stated above.⁵

Furthermore, Ishimatsu is not directed to or related to a coil for a rotating electric machine. Instead, Ishimatsu is directed to bonding or mounting electronic components on a circuit board. Applicants submit there is no teaching, suggestion, or motivation, either explicitly or implicitly, in either reference to combine the stator coil of Mori with the circuit board mounting techniques of Igashira to arrive at Applicants' inventions recited in Claims 1, 2, 13 and 16. That is, the mounting techniques of Ishimatsu are totally irrelevant to the technical field of the electric rotating machine of the present invention. Thus, Applicants

⁵ MPEP § 2142 "...the prior art reference (or references when combined) must teach or suggest **all** the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)."

submit it is only through an impermissible hindsight reconstruction of Applicants' invention that the rejection of Claims 1, 2, 13 and 16 can be understood.⁶

Finally, even assuming *arguendo* that Mori and Ishimatsu disclose each feature of Applicants' claimed invention, because Ishimatsu fails to disclose that the polyvinyl alcohol is soluble in a resin, the combination of Mori and Ishimatsu would fail to prevent the inorganic particles from flowing out while maintaining the dissolubility of the adhesive, as is possible with Applicants' claimed invention.

Finally, Claims 13 and 16 of the present application recite a mica tape and a mica sheet, respectively, which are so configured that inorganic particles are supported by a glass cloth backing using an adhesive containing glue insoluble in impregnating resin as an indispensable component. Applicants submit this mica tape or mica sheet is not disclosed or suggested by any of the cited references.

Accordingly, in light of the previous discussion, Applicants respectfully submit that the present application is in condition for allowance and respectfully request an early and favorable action to that effect.

Respectfully submitted,

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⁶ MPEP § 2143.01 "Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge of one of ordinary skill in the art."